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No. 234

April 4, 1975

Dr. H. Shull
National Academy of Sciences of the
United States of America
2101 Constitution Avenue
Washington, D.C. 20418
U.S.A.

Dear Dr. Shull:

In accordance with the plan for joint work by our sub-group on the problem relating to "Systems for Stimulating the Development of Basic Research," the Academy of Sciences of the U.S.S.R. has organized work for the compilation of surveys describing the system of stimulating the development of basic research, as well as for the description of concrete situations characterizing the decision-making processes.

We have now drawn up detailed work plans for the writing of surveys about the Governmental system of formulating a science policy and managing basic scientific research as well as for research on the subject, "Establishment of Large Scientific Centers" (on the order of the Novosibirsk "Academgorod" [Academic City]). Scientists who

will be entrusted with the drawing up of such surveys and carrying out of research connected with the description and analysis of concrete situations have been selected. I attach the referenced plans to this letter.

Some delay in the implementation of the work set forth in the joint plan is attributable to the fact that in the development of the detailed plans for the surveys and the analysis of the concrete situations it became evident that it was necessary to involve a larger group of experts than was originally contemplated.

I am pleased to advise you that in conformity with the wishes expressed by the President of the Academy of Sciences of the United States, Dr. P. Handler, about research on problems of science policy in the field of basic science within the framework of the Agreement between the Academies of Sciences of the U.S.S.R. and the U.S.A., the President of the Academy of Sciences of the U.S.S.R., Academician M.V. Keldysh, at my request, entrusted the direction of this work, on our side, to Academician N.M. Zhavoronkov, Member of the Presidium of the Academy of Sciences of the U.S.S.R. As you doubtless know, N.M. Zhavoronkov is a prominent scientist in the field of general chemistry and chemical technology; he heads the Institute of General and Inorganic Chemistry of the Academy of Sciences of the U.S.S.R. and is the Director of the Department of Physical Chemistry and Technology of Inorganic Materials of the Academy of Sciences of the U.S.S.R.

The designation of Academician N.M. Zhavoronkov, whose position in the Academy of Sciences of the U.S.S.R. corresponds to your position in the National Academy of Sciences of the U.S.A., as Director of the working sub-group on the problem of "System of Stimulating the Development of Basic Research," will greatly facilitate the solution of an entire series of questions on problems of science policy which arise in the process of implementation by our side of the Agreement between the two Academies.

Sincerely yours,

/signed/

V. Filipov

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PLAN OF SURVEYS ON THE SUBJECT OF

"NATIONAL SYSTEMS OF FORMULATING SCIENCE POLICY
AND MANAGEMENT OF BASIC SCIENTIFIC RESEARCH"

- I. Development of a science policy in the field of basic research.
 1. Generally accepted definitions of basic and applied research.
Change in the content of the concept of basic research.
Examples of research of a new type, amalgamating the characteristics of basic and applied research and development, typical of the activities of the Siberian branch of the Academy of Sciences of the U.S.S.R.
 2. Definition of the concept of science policy in the field of basic research. (By science policy we shall mean the selection of the most promising scientific directions in view of the assigned objectives and corresponding allocation of funds.)
Classification of scientific directions, alternate principles thereof, the most rational basis for such classification of basic scientific goals.
Examples of decisions by the Presidium of the Academy of Sciences of the U.S.S.R., sections and branches of the Academy of Sciences of the U.S.S.R. reflecting science policy in the field of physics over a period of years.
 3. Need to develop definite science policy in the field of basic research.

Expansion of the horizon in research and increases in ex-

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need to develop a definite science policy. Objective limits on resources allocated by the Government

for carrying out basic research. The role of the Academy of Sciences of the U.S.S.R. in developing and implementing a national science policy in the field of basic science and research.

4. Formulation of science policy in the field of basic research.
 - a. Factors influencing the development of basic research:
 - objectives of the development of basic research, formulated in directives relating to the five-year economic development plan of the U.S.S.R.
 - overall governmental expenditures for basic research, their direction of change. Data on financing of basic research in the field of physics.
 - other sources of financing for basic research; relative size of resources provided by different sources. Examples of scientific research in the field of physics financed from outside the budget.
 - level of development of different scientific trends:
Scientific achievements stimulate financing of research. Examples of notable scientific results in the field of physics which led to a change in science policy.
 - influence of the composition and qualifications of scientific workers on research conducted. Important role of the personality of the scientist in basic
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research. Example of the influence of prominent scientists-physicists on the establishment of schools of science.

b. Difficulties in formulating and implementing science policy in the field of basic research:

--high level of uncertainty characterizing time frame and results in basic research;

--subjective nature of the information about the state and trends in the development of different scientific fields;

--limitation of funds;

--dependence of possible directions of research on the composition of the potential group of researchers.

c. Existing mechanism for the formulation of science policy in the field of basic research.

(The Presidium of the Academy of Sciences of the U.S.S.R., guided by general government policy and the logic of developing science, establishes the basic directions of research.)

d. Methods for implementing science policy.

The role of the Presidium of the Academy of Sciences of the U.S.S.R. in the formulation and implementation of science policy in the field of basic research. Description of the activity of the Presidium of the Academy

of Sciences of the U.S.S.R. in the formulation and implementation of science policy.

5. Retrospective analysis of the results of the implementation of a given science policy in the field of basic research over a number of years.

Analysis of the forecasts of development of different fields of physics.

Decisions of the President of the Academy of Sciences of the U.S.S.R. concerning the development of research in one of the fields of physics.

6. Analysis of alternative methods and organizational forms of developing science policy in the field of basic research. Approaches related to centralization and decentralization in the formulation of science policy; evolution of organizational forms for elaboration of science policy.

II. Management of Basic Research

1. Definition of the concept of management of basic scientific research.

Content of the concept of management of scientific research.

Forms of management of basic research, taking into account their specifics. Management of basic research by the

Presidium of the Academy of Sciences of the U.S.S.R.; goal-directed allocation of funds on the basis of an analysis

of the current status and trends in the development of

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scientific fields and established groups of scientific

Examples of management of scientific research in the field of physics on the part of the Presidium of the Academy of Sciences of the U.S.S.R. over a period of years.

2. Methodological aspects of predicting basic scientific research.

The problem of defining the time frame in projecting basic scientific research. Factors influencing the realizability of projections. Applicability of existing methods of projections for basic research.

3. Methodological problems of planning basic research:

The tasks of long-range planning of basic research:

- establishment of priorities among and within scientific fields; designing a plan for long-range directions;
- consideration of the needs of society in planning basic research.

A survey of existing methods of long-range planning of basic research. Classification of methods of long-range planning of basic research:

- methods of evaluating proposals
- matrix methods
- methods of multicriteria evaluation of scientific directions

A critical analysis of existing methods from the point of view of their adequacy for the specific features of basic research.

Methodology of planning basic research in the Academy of Sciences of the U.S.S.R.

4. Territorial distribution of scientific centers.

Factors influencing decision-making about the establishment of new scientific centers. Distribution of resources among scientific centers.

5. Ensuring dissemination of information about decisions in the field of basic research, following the example of the allocation of resources in the field of astronomy.
6. Existing organizational mechanism in the system of management of basic scientific research, its structure and effectiveness. Description of the mechanism for formulating the plan and distributing resources by the Presidium of the Academy of Sciences of the U.S.S.R.

III. Role of Institutions of Higher Education and Industrial Scientific Research Institutes in the Conduct of Basic Research.

1. Specifics of the conduct of basic research in Institutions of Higher Education and Industrial Scientific Research Institutes.
2. Participation of Institutions of Higher Education and Industrial Scientific Research Institutes in the development of science policy in the field of basic research.
3. Sources of financing basic research in Institutions of Higher Education and in Industrial Scientific Research Institutes.
4. Existing mechanisms and organizational forms for management of basic research in Institutions of Higher Education and Industrial Scientific Research Institutes.

IV. Application of Results of Basic Research

1. Critical analysis of the status of the problem.

- a. Existing organizational mechanisms and methods for planning and management of the application of the results of the basic research and the trends in the development thereof. Description of the existing mechanisms on the model of the "plan for the application of new technology" formulated by the Academy of Sciences of the U.S.S.R. Participation of the Academy of Sciences of the U.S.S.R. in the solution of especially important problems of the national economy in consonance with the plan of the State Committee on Science and Technology. Description of the "applied research and development belt" of the Siberian Department of the Academy of Sciences of the U.S.S.R.
- b. Stimulation of activity with a view to the practical application of the results of basic research. Description of the existing mechanisms for rewards for discoveries and inventions leading to practical applications, based on examples of inventions in the fields of physics and chemistry.
- c. Merits and deficiencies in existing organizational forms and methods of management and stimulation of application of results of basic research.

2. Analysis of possible organizational systems and methods of putting results of basic research into practice.

Description of possible ways of effecting a rapprochement between basic research and industry.

--direct transfer of results of research from basic scientific research institutes to industry.

--carrying out of basic research projects in joint scientific-industrial associations.

3. Analysis of possible ways to improve existing systems of putting results of basic research into practice.

a. The existing system of safeguarding copyrights and patents.

b. New laws of payment for sales of licenses.

c. Wide exchange of information about results of basic research conducted in the U.S.S.R.

PLAN

FOR RESEARCH ON THE SUBJECT, "ESTABLISHING
MAJOR SCIENTIFIC CENTERS (MODELED ON THE
NOVOSIBIRSK ACADEMIC CITY)."

- I. Genesis of the idea and objective of the establishment of a major scientific center in Siberia.
 1. Problems of developing science and the socio-economic development of Siberia and the Far East.
 2. The material and scientific and technical base for the establishment of a major, complex scientific center in Novosibirsk; level of development of research in Siberian scientific institutions.
 3. The mechanism and procedures for preparations and the adoption of decisions for creating the center:
 - a. Consideration of the problem by scientists and the general community;
 - b. The role of individual government and community organizations in the preparation of proposals for the creation of the center;
 - c. Creation of a Committee of the Presidium of the Academy of Sciences of the U.S.S.R. for the organization of a Siberian Department of the Academy of Sciences of the U.S.S.R.; preparatory work completed by the Committee.
 - d. Adoption of the government decision "On the Establishment of the Siberian Department of the Academy of Sciences of the U.S.S.R."

4. Problems entrusted to the new scientific center
 - a. Development of basic scientific research in Siberia and the Far East, with priority in the field of mathematics, physics, chemistry and biology;
 - b. Dissemination of scientific knowledge;
 - c. Cooperation in the solution of concrete problems in the social, economic and cultural development of the given region of the country and the utilization of the natural wealth of Siberia;
 - d. The training of scientific personnel for Siberian scientific institutions.

II. Organizational measures for the establishment of the Novosibirsk Academic City.

1. Establishment of an Organizing Committee and Scientific Council, their activity in the formation of the structure of the Academic City and the basic direction of research;
 - a. The determination of the location and size of construction of the Academic City;
 - b. Determination of the organizational principles of activity of the Siberian Department and its scientific institutions. Preparation of draft Regulations of the Siberian Department of the Academy of Sciences of the U.S.S.R.
2. The organization of combined scientific councils and councils for separate tasks, their objectives and roles in the formation and coordination of scientific research.

3. The creation of administrative institutions and house-keeping services: Staff of the Presidium of the Siberian Department of the Academy of Sciences of the U.S.S.R.
4. Measures relating to the financial, material and other services for the operations of the center:
 - a. Problems of building and equipping the scientific institutions;
 - b. Informational services--establishing libraries (State Public Scientific and Technical Library), scientific journals;
 - c. The solution of socio-economic problems of living and activity of scientific personnel; (housing construction, child care centers, schools, medical facilities, cultural and educational establishments, rest facilities);
 - d. The role of creative contacts of scientific institutions with industrial enterprises.
5. The solution of staffing problems of the new scientific center:
 - a. Principles of the formation of scientific collectives;
 - b. Special rights of the Siberian Department in the selection of personnel during the period of creation of the center;
 - c. The establishment of the Novosibirsk State University;
 - d. The training of personnel through graduate students;
 - e. The physico-mathematics school;

- f. The cooperation of the scientific institutions of the nation, role of individual scientists in the solution of the problem of staffing.

III. Current structure of the Center. The organization and planning of scientific research, problems relating to ensuring its success.

1. The position of the Siberian Department in the structure of institutions of the Academy of Sciences of the U.S.S.R.
2. The managerial scientists and administrative organs of the Siberian Department, their interrelation with the actual management organs of the Academy of Sciences of the U.S.S.R.
3. Satellites of the Siberian Department, structure of their scientific institutions.
4. The system of planning scientific research at the center-- degree of centralization and decentralization.
5. Mechanics of financing and the material and technical support of the Siberian Department.

IV. Outlook for the development of the Novosibirsk Scientific Center.

1. The establishment of the center, its scientists, scientific achievements, prominent scientific schools.
2. Current structure, volume and dimensions of research at the Academic City.
3. Role in the utilization of natural resources and the socio-economic development of Siberia.

4. New forms of organization for research facilitating the rapid introduction of scientific results into practical application.

PLAN

FOR RESEARCH ON THE SUBJECT OF THE EVOLUTION OF THE ORGANIZATIONAL FORMS FOR THE SOLVING OF THE PROBLEM OF "THE DEVELOPMENT OF NUMERICAL METHODS OF (COMPUTERIZED) WEATHER FORECASTING"

1. Adoption of the decision to organize the meteorological service of the U.S.S.R. in the 1920's--acknowledgment of its importance to the national economy.
 - a. Basic objectives assigned to the Hydrometeorological service so as to facilitate hydrometeorological forecasting for the nation;
 - b. The condition of theoretical research in the field of meteorology and its application in practice to compile hydrometeorological forecasts.
2. Formation of a scientific school in the field of theoretical meteorology; analysis of trends in the practical orientation of meteorology as an exact science.
 - a. Development of research in theoretical (dynamic) meteorology under the direction of A.A. Fridman at the Main Geophysical Observatory (GGO):
 - b. Establishment of a scientific school of dynamic meteorology at the Main Geophysical Observatory during the 1920's and 1930's (works by N.E. Kochin, I.A. Kibel', A.A. Dorodnitsyn and others); the construction of theoretical models of atmospheric circulation and the interrelation of fields of pressure, temperature and wind in the atmosphere;

- c. The works of I.A. Kibel' in the 1930's and 1940's establishing the beginning of the application of theoretical results of dynamic meteorology to the problems of weather forecasting.
3. Adoption of the decision to develop research on the problems of dynamic meteorology at the Academy of Sciences of the U.S.S.R.
 - a. Creation at the Central Institute of Weather Forecasting of the Hydrometeorological Service of a section of dynamic meteorology for the development of research in dynamic meteorology and the execution of laboratory experiments of new methods;
 - b. Creation at the Geophysical Institute of the Academy of Sciences of the U.S.S.R. of a section of dynamic meteorology for the conduct of basic research and the training of graduate students;
 - c. The creation in 1956 at the Academy of Sciences of the U.S.S.R. of an Institute of Applied Geophysics and an Institute of Physics of the Atmosphere, substantial expansion of research in dynamic meteorology, differentiation of objectives between the newly created institutes;
4. The creation of an interdepartmental commission under the direction of the Academy of Sciences of the U.S.S.R. for the preparation of a decision to establish a new institution within the system of the Main Administration of the Hydrometeorological Service for the development of work on the numerical methods of weather forecasting.

- a. Successes of theoretical research in dynamic meteorology and methods of numerical weather forecasting; the application of EDP provides a qualitative jump in the application of theoretical work to the practical preparation of weather forecasts.
- b. The necessity of concentrating the efforts of the scientific community of the Academy of Sciences and the Hydrometeorological Service in the further expansion of the area of research by the use of EBP; the creation of a special commission for the consideration of these questions and the preparation of recommendations to the Presidium of the Academy of Sciences of the U.S.S.R. and the Main Hydrometeorological Service for the adoption of decisions.

5. Procedures for the establishment of a World Meteorological Center within the system of the Hydrometeorological Service under the Scientific direction of the Academy of Sciences of the U.S.S.R.

- a. Consideration by the Presidium of the Academy of Sciences of the U.S.S.R. and the Main Hydrometeorological Service of the recommendation of the Commission and the preparation of decisions regarding the establishment of the World Meteorological Center with the objective of the development of theoretical research in dynamic meteorology and the application of the results in practical weather forecasting;
- b. The establishment of the World Meteorological Center and concentrating highly qualified personnel within it;

6. The further development of research in the field of theoretical

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meteorology within the framework of the Academy of Sciences of the U.S.S.R.

- a. The development of research at the Institute of Physics of the Atmosphere of the Academy of Sciences of the U.S.S.R. in the field of atmospheric turbulence and the transfer of radiant energy;
 - b. The establishment of a base and the development of research in dynamic meteorology and numerical methods of weather forecasting at the Siberian Department of the Academy of Sciences of the U.S.S.R. (work of G.I. Marchuk and his students).
7. The procedures for establishing the structure and functions of a scientific council on the question of "Weather Forecasting".
- a. The establishment of a Scientific Council of the Academy of Sciences of the U.S.S.R. on the question of "Weather Forecasting"; scientific-methodological direction of the Council is effected by the Earth Science Section of the Presidium of the Academy of Sciences of the U.S.S.R. jointly with the Main Hydrometeorological Service;
 - b. The rights and responsibilities of the Scientific Council;
 - c. The structure of the Scientific Council.
8. Scientific Councils and the methodological direction on the part of the Academy of Sciences of the U.S.S.R. is one of the forms of coordination and administration of complex basic scientific research.

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- a. Form of organization of the Scientific Council;
 - b. Role of the Scientific Councils in the coordination of research in complex problems and scientific trends;
 - c. The composition of the Scientific Council, its responsibilities and rights;
 - d. Typical structure of the Scientific Council;
 - e. The exercise of functions by the Scientific Council;
 - f. The material and technical support of the activities of the Scientific Council.
9. The current status of the problem.
- a. The current status of the problem in the field of numerical methods of practical weather forecasting;
 - b. The current status of the problem in the field of numerical methods of long-range weather forecasting;
 - c. The current status of research necessary for the improvement of weather forecasting:
 - in physics of the atmosphere;
 - in physics of the ocean;
 - in earth-solar relations;
 - in meteorological information.

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WASHINGTON, D. C. 20418

FOR TRANSMITTAL

TO ADDRESSEE *ans 7/14*

STATINTL

FEB 14 1975

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*I didn't receive the attachments &
they were not available in CES.*

Dr. V. A. Filippov
Head, Science Organization Department
Academy of Sciences of the U.S.S.R.
Leninskiy Prospekt, 1y
Moscow, U.S.S.R.

Dear Dr. Filippov:

I had hoped to be able to forward to you the agreed-upon outlines of our various projects long before this time, but the holiday season and the busy programs of many of our scientists have led to delays in their preparation.

With this letter, I am enclosing the outlines of the studies we have agreed to undertake. They incorporate suggestions received from our reviewing groups of experts and academicians. We hope that you will involve similar groups of experts on your side so that we can benefit from your own comments and suggestions in the very near future.

The work on the joint scientific assessment has been delayed while we await the reply of the Soviet Academy to my letter of December 17, 1974, which we have not yet received. We believe it is important to proceed immediately with the meeting of experts I suggested in that letter in order for fruitful progress to be made. I hope you agree.

Further work on the case studies depends upon receipt of your outlines. The protocol calls for parallel development of outlines of similar case studies, the exchange of comments, and exchange visits of experts. This is to assure that the resultant papers are properly responsive to the interests and questions of the other side. I therefore hope that the corresponding material from the Soviet side will be available to us in the very near future, and also that we will receive comments from you on our outlines at an early date to facilitate this interaction.

I would like to suggest that you and I agree to exchange informal letter progress reports (similar perhaps to my letter of December 17 and this letter) not less often than every two months so that we understand the current progress being made on the individual projects. That will also make it possible for us to identify at an early stage the most appropriate opportunities for exchange visits.

In connection with quite another program, the informal private meetings between our two Academies, I will be part of the U.S. National Academy of Sciences delegation in Moscow on April 7, 8, 9 inclusive. I would like to

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Sci. Policy*

Dr. V. A. Filippov

February 14, 1975

Page Two

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review with you at that time progress on our joint effort and would be pleased to meet with others who are involved in the joint work program. It would be possible for me to stay over in Moscow on April 10 and 11 for that purpose if that is convenient for you.

I want to express again my deep appreciation for your hospitality last fall, and to say how delighted I was to receive your holiday greetings. I look forward to seeing you and all my other Soviet friends again in April.

Sincerely,

Harrison Shull

Enclosures

Attachments to letter to Dr. Filippov fr. Harrison Shull
2/14/75:

1. The Decision to Build the VLA
2. Eradication and Suppression of the Screwworm Fly by the Sterile Male Technique
3. The U.S. Interdisciplinary Materials Research Laboratory Program
4. Brookhaven National Laboratory - Problems of Establishing and Managing a Large, Complex Organization for Scientific Research in the Nuclear Sciences
5. Ministudies of New Initiatives in Science
6. An Ecosystems Integrated Research Program
7. Retrospective Analysis of Surveys in the Field of Physics
8. National Systems of Policymaking and Management for Fundamental Scientific Research
9. National Systems of Policymaking and Management for Fundamental Scientific Research (Notes to accompany No. 8)